Unauthorized sharing through P2P networks:  
A digital pollution?

First Draft

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Abstract
Cyberspace is far from being a closed world. Unauthorized sharing of copyrighted contents is often claimed to affect new online business. Unfortunately, there are not enough empirical studies that highlight its actual impact, and most of the time, their results do not converge. This paper identifies several scenarios about the economic consequences of unauthorized sharing. In each case, existing arrangements —property rights, indirect liability, state subsidies, and so on— are compared in order to determine the most efficient one, i.e. the arrangement from which online intermediaries, content users and copyright holders can equally benefit at the lowest social cost.
1. Introduction

Cyberspace is far from being a closed world. Online exchanges are currently subject to the same legal rules as the ‘real’ world. Moreover, they could impact deeply traditional business as well as ecommerce. For instance, unauthorized sharing of copyrighted contents\(^1\) figures among the digital practices that are often claimed to constitute a threat for content industries. Unfortunately, there are not enough empirical studies in order to highlight their actual economic impact. More investigations are needed to determine whether these illegal practices actually represent a net social loss as the major record and film producers claim it\(^2\).

This practice has begun in the 70s with the exchange of audiocassettes among individuals. The recent success of peer-to-peer (P2P) networks has resulted in increasing such exchanges on a much broader scale. In reaction, content industries have taken various legal actions in order to eliminate P2P sharing and thereby to favor the advent of online music business. However, such enforcement may eliminate social benefits associated with online sharing and P2P innovation.

This paper tries to assess the possible social benefits and losses associated with the elimination of noncommercial sharing. The idea underlying the paper is that ‘taxing’ polluters and prohibiting pollution by securing property rights are not always the best way to maximize wealth. Different scenarios are envisaged depending on whether P2P sharing is considered as a kind of digital pollution and whether it is socially desirable to compensate authors and their business partners. In each case, existing institutional arrangements are compared to determine the most efficient one, i.e. the one from which intermediaries ('gatekeeper'), content users and copyright holders can equally benefit at the lowest social cost.

2. Is there some harm somewhere? The existence and the nature of ‘digital pollution’

Whether unauthorized sharing can be subject to legal actions is one thing. Another thing is to hold these activities as the main responsible for the current difficulties of the record industry. Record producers currently aim at eliminating illegal P2P networks. They argue that such practice not only infringes their copyrights, but also it causes serious economic damages. More precisely, it is considered as: (1) being the major determinant of the slump of record sales in many countries and (2) impeding the new business of online music distribution.

This last argument is partially false when we consider the success of the Apple's iTunes store. More generally, linking the massive slide in recorded music sales with the explosion of online P2P sharing proves to be a simple intuitive observation rather than a robust scientific result. Of course, US sales of CDs fell in 2001 for the first time since it was introduced in 1983. Of course, this fall coincides with the expansion of P2P sharing of music and the fact that big consumers of music are also those who use the most P2P networks.

But many other factors are to be taken into consideration. First, the contraction of records purchases coincides also with the overall communication boom (mobile phones, broadband access…) as well as the renewal of audiovisual equipment of households (plasma screens, LCD, DVD, PVR…) that progressively takes up significant place in the households budget. Secondly, publishing strategies of the major companies are often thought to be too much based on compilations, old famous compositions and existing stars. By contrast, in France, independent music labels don’t suffer from record market slump. In the same way, since the early 1990s, music exposure on the biggest French TV channels is strictly limited to old famous compositions leading to the reduction in exposure of diversified music by TV channels\(^3\). More than P2P and noncommercial sharing, this lack of diversified exposure on TV and the difficulties associated with the renewal of repertoires would explain the recent slackening of the record market. But there are not enough scientific investigations that permit to pertinently assess this idea. Thirdly, CD represents a product localized at the end of its life cycle. And no innovation has occurred since its introduction in 1983. But CDs’ prices don’t reflect this maturity phase. A slackening of the CD sales could be largely interpreted in such a manner. By contrast, P2P initiates a revival in music consumption and it seems to impact favorably CD sales\(^4\).

Finally, there is no consensus amongst the few studies that assess the link between record sales and P2P sharing. On the one hand, Fine (2000) and Zentner (2004) show that file swapping may substantially decrease music purchases. Zentner estimates that music sharing may explain a drop on music sales of 7.8% in the countries considered. On the other hand, Oberholzer & Strumpf (2004), Boorstin (2004) and Holm (2003) show that P2P

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1 Unauthorized noncommercial sharing can be made directly by swapping CDs (offline sharing) and through P2P networks by sharing digitalized contents (online sharing). They are not under the regime of fair use or private copying exemptions

2 As a matter of fact, to suggest that their impact is necessary negative without providing robust evidence may have serious consequences such as the prohibition of socially beneficial activities and a too much costly reinforcement of copyright. Alternatively, no regulation can be justified by the opposite presumption but in fact may have negative consequences by harming seriously the dynamics of cultural industries.

3 For instance, the French musical TV reality show ‘Star academy’—which tries to launch young stars— is only based on the performing of well-known songs.

4 According to Nielsen SoundScan, record market increased by 9.1% in the first three months of 2004. As for other contents such as DVD, P2P seems not to impact the market progression
has no significant impact on music sales. But none of these studies makes econometric test about the relation between a set of variables such as the market price of originals, the purchasing power of households, the evolution of their communication spending, the broadband access subscriptions, and so on, and dependent variables such as number of shared contents and copying rate.

**Two acceptable hypotheses: Content creation and sharing as sources of positive externalities**

Nevertheless, two facts can be considered as acceptable hypotheses to ground any analysis in the field of unauthorized sharing.

1. **Artistic creation is a source of positive externalities.** Here, copyright law is not to be conceived as an encouragement tool to produce new works, but essentially as a social reward for already made works. One question is the desirability of such social reward. Whereas economists have many things to say about the ability of copyright rules to induce people to produce new works, it seems very difficult for them to settle the essential question, whether or not a social reward should be recognized to authors and their economic partners. Anybody could argue in favor or against this general option, but such debates are more likely to be of political rather than scientific nature.

2. **Noncommercial sharing is a source of positive externalities.** By swapping copyrighted contents through physical or online networks, copiers draw some utility. They organize a circulation of works on a scale never reached by now and thereby their sharing entails an increase in the use of cultural contents. The question is, whether these social gains are enough to legitimate a legalization of noncommercial sharing.

Hence, according to the social choice to impose property rights, to reward creators for their contribution or to legalize P2P sharing, economists can scientifically compare the various existing arrangements to determinate the more efficient one.

3. *Pollution* scenarios and efficient institutional arrangement

By analogy with environment pollution, ‘copiers’ are supposed to act as ‘polluters’ and copyright holders are assimilated to the ‘polluted’. The first category encompasses both direct beneficiaries –individuals who share contents for their own pleasure– and indirect beneficiaries such as ISPs. Three scenarios are to be considered according to the existence and the nature of the ‘digital pollution’, i.e. the negative externalities supposed to affect content industries: (1) Pollution, (2) No pollution but social preference to compensate copyright owners, and (3) No pollution and no compensation. For each scenario, I suggest that there is no one single efficient fit-for-all institutional arrangement, but rather specific solutions that require case-by-case costs/benefits analysis.

3.1. Case 1: Net social loss due to unauthorized sharing (*pollution* hypothesis)

In the first case, P2P sharing imposes significant losses to content producers so that arrangements are to be designed to eliminate it. Two issues then are to be solved: (1) Who must pay to eliminate its negative effects: polluters or polluted? (2) Who are the polluters: individuals who share contents, recording material manufacturers, ISPs, universities...?

The hypotheses underlying this first scenario are the following:

1.1 Noncommercial sharing of copyrighted content impacts negatively their traditional commercial distribution and new kinds of distribution such as e-commerce and commercial streaming.

1.2 This constitutes net welfare loss because the social gains associated with unauthorized sharing are not sufficient to overcome its social costs. So this can argue for copyright enforcement.

Various legal and technological methods are to be found in order to eliminate or strictly restrict noncommercial sharing. All of them are currently applied simultaneously by recording industries, but some can be more socially efficient. All these arrangements but third-party liability hold systematically noncommercial users as polluters. And they all represent social costs due to their implementation and consequences on social welfare. So efficiency comparative analysis aims at determining which one permits to eliminate significantly unauthorized sharing with a minimized social negative impact. The optimal solution is that copyright enforcement costs do not annihilated the very net social gain to maintain exclusive rights over noncommercial sharing.

- **Trials against direct infringers**

Copyright holders could bring legal actions against infringers by supervising sharing networks and detecting infringing uses. Faced with unprecedented levels of unauthorized sharing –described by copyright stakeholders as piracy–, the recording industry brought legal actions first against online intermediaries such as Napster and
KaZaA and then against individuals. This legal fight against peer-to-peer practices is likely to expand to the limit that copyright owners obviously cannot sue all infringing individuals. These civil and criminal suits against high-volume uploaders are much more thought to deter (high) risk-adverse users from engaging in such unauthorized activities.

However, the deterrence effect and the legal result of such suits would be far from being established. In many countries, the probability to be caught and found guilty is very small. It is all the more true since majors announced that they limit their legal prosecution against big users of such P2P networks. Moreover, P2P networks are only one possibility of sharing contents. This legal fight is not really feasible against copiers who swap directly CDs or DVDs. Another serious question about such legal fight is potential dangers to participants’ privacy and legal rights. Finally, as suits against Napster have been partly held responsible for the success of next-generation systems such as KaZaA and eMule, the same situation could prevail with the proliferation of camouflage and anonymity technologies (see Friedman, 1996).

Consequently, another legal actions are to be devised in order to substitute for or to complete trials against individuals, which could be considerer as wasted effort (‘a teaspoon solution to an ocean problem’, as Randal Picker said). Implementing self-help systems or imposing a third-party liability are often proposed as appropriate responses to unauthorized sharing and to make copyright protection effective in the digital economy?

- **Self-help systems and anti-circumvention provisions**

Copyright enforcement can be made through ‘self-help systems’ such as digital right management (DRM), digital locks and other surveillance systems (Schlachter, 1997, Dam, 1999, Farchy & Rochelandet, 2003). Just as an individual creating a physical object might seek to protect his or her property by placing it in a safe, for example, contents producers use software systems. The more watertight the self-help system the greater the guarantee that providers can protect contents against copying and minimize the value lost to unauthorized users. Then copying and sharing of copyrighted contents would disappear or become significantly marginal. Most uses then would be purchases of originals. In such an ideal world, copying and sharing even should be authorized because they would not be technically feasible anymore.

However, protection systems are far from invulnerable. P2P networks increase this vulnerability because knowledge about and concrete results of circumvention techniques are widely shared. Producing technologies require time, skills and human investment. But they can be technically assimilated at low cost by anyone who is computer-literate. This is all the more true since there exist considerable synergies through Internet forums. With respect to protection systems, content providers and copiers thus find themselves engaged in a technology race whose outcome is somewhat unclear and could undermine online and traditional business. Therefore, different international conventions and national law have been passed in order to protect copyright owners against circumvention. The obvious reason to implement such a legal framework is to prevent widespread distribution of neutralization technologies. According to Fisher (1998), digital technologies are to be protected on a legal basis so that content producers are able to price discriminate to the benefits of consumers.

However, three main concerns have been put forward about DRM and their legal protection.

Firstly, such technologies and legal reforms could dramatically reinforce the market power of certain rightholders such as major companies by strengthening their control over the value chain (Farchy & Rochelandet, 2003). Self-help systems may become competitive arms that are not within reach of every producer. Majors could reinforce their control over users as well as creators and small producers. The levels of investment required – in terms of research, standardization, etc.– represent an entry barrier that runs the risk of smaller producers and isolated artists being excluded. The elimination of P2P networks represent social costs and these costs are all the more important since noncommercial sharing appears to be an alternative way to distribute diversified contents excluded from dominant distribution channels.

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5 The music industry has already sued about 3,000 people in the United States and has announced more than 230 legal prosecutions in Denmark, Germany, Italy and Canada.


7 So detractors of copyright law claim the complete revision of copyright law. It is claimed to harm contractual freedom and to hamper the emergence of new forms of distribution (Meurer, 1997, Varian and Shapiro, 1998).

8 As Dam (1999) points out: “one can view the copier as the attacker, with the content provider responding to copying by using ‘defensive’ self-help systems. Then defensive techniques will arise to overcome the defences to copying (or to alterations) not authorized by the content provider, and so on ad infinitum.”

9 Since the WIPO treaties on copyright adopted in 1996, USA and European Union have reinforced their respective copyright laws to adapt them to the digital economy. The US Digital Millennium Copyright Act (DMCA) was enacted in 1998 and the adoption of the European Union Copyright Directive (EUCD) was adopted in May 2002. These laws prohibit any act and any sale, importation of devices aimed at neutralising digital technologies designed to enforce copyright. Thus the facts of hacking anti-copying software or removing copyright information about the name of the author or a right management code have to be sanctioned. Both DMCA and EUCD give a legal protection to exclusion technologies designed to enforce rights over intangible goods whose nonrival nature is intensified by digital technologies. See Rochelandet (2002).
Secondly, many supporters of self-help systems (Mackaay, 1996, Bell, 1998, Friedman, 1998) contest the necessity of protecting them on a legal basis. According to such perspective, it is socially preferable to let content suppliers enforce by their own their rights through digital enclosure. By contrast, anti-circumvention provisions are thought to discourage them from innovating in the competition race with hackers. Such legislation may have a counter-productive impact on encryption and security research. By contrast, no legal protection avoids overprotection given that content suppliers internalize fully their enforcement costs.

Finally, a major risk associated with self-help systems and their legal protection is that they may unbalance the proper equilibrium between copyright holders and content users (Cohen, 2000, Lessig, 2003). In particular, Cohen (2003) and Katyal (2003) emphasizes the dangers on users freedom and privacy these technologies creates by collecting information about individuals’ intellectual habits and preferences. In the same way, some lawyers and economists (Samuelson, 1999, and Cohen, 2000) show how DMCA could endanger also cultural diversity and creativity. Up to now, users have benefited from some exceptions and limitations among which the most important are the limited duration of protection and fair use doctrine that enables such things as parody and quotation. The DMCA provisions challenge this equilibrium because anti-circumvention rules prevent users to use digitally protected content when these uses are under fair use regime or fall in the public domain. Indeed, in order to make such uses, users have to defeat technological protection and in so doing, they violate the section §1201 of the Copyright Act.

- ‘Sabotage’ and intrusion

Similar criticisms can be made against another technical weapons to fight against noncommercial sharing: ‘sabotage’ and intrusion. By directly aiming at individual users, they consist in inoculating or contaminating online sharing networks and individuals’ computers with false files (for instance, incomplete records). According to the recording majors, such actions as well as suits against individuals are effective as the recent decline in file swapping has shown it. In fact, this evolution concerns essentially Kazaa users and it can be explained also by the nature of this server, based on advertising, polluted by pornography and considered as technically inefficient by many of its initial users that had migrated towards other file-swapping technologies.

Sabotage and intrusion, however, present two main drawbacks. Firstly, in the same manner as prohibitive tax (see below), they could eliminate many legal acts and materials. Secondly, their very efficiency is questionable: Not only their impact proves marginal because offline sharing is not affected and could even act as a filter for online copiers, but also technical solutions may develop in order to identify false files (as well as virus).

Basically, one concern is, whether ‘sabotage’ or intrusion could keep on being legally recognized as means of private enforcement. After all, even though file sharing is illegal, the inoculation of false files by record producers can impact negatively the reputation of the authors and performers of the falsified work? At worst, in countries where moral rights of authors are fully recognized, such act could violate their fundamental rights. It is all the more problematical since many authors, composers, actors and performing artists are not against P2P sharing.

- Third-party liability

Another powerful legal weapon consists in holding intermediaries (ISPs, recording material manufacturers, etc.) liable for unauthorized sharing. In the same way, copyright stakeholders suggest that prohibitive tax should be implemented on the uploading flows in order to eliminate P2P swapping. Such a solution amounts to holding intermediaries liable because it mainly impacts their business.

Detecting and policing all direct infringers represent insurmountable costs. Third-party liability could therefore be an efficient tool for copyright enforcement because identification of ISPs and recording material manufacturers are comparatively easy. In the case considered here –i.e. noncommercial file sharing as a pure pollution–, liability is not conceived as a mechanism for compensating copyright holders, but essentially as an enforcement tool aiming at eliminating unauthorized sharing.

Holding intermediaries (ISPs and recording material manufacturers) indirectly liable for copyright infringement committed by direct infringers amounts to confer entitlements to copyright holders. So two questions are raised: (1) Is it socially desirable? And (2) if so, what liability arrangement is the most efficient?10

As for the first question, holding intermediaries (or ‘gatekeepers’) legally liable for illegal actions initiated by individual copiers appears to be the most effective way to eliminating illegal online file-sharing and to preserve legal business. Online intermediaries de facto are in the best technical position to prevent and police copyright violations.

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10 These considerable questions have been widely tackled in the law and economics literature. For instance, see Woodfield (2004), Landes & Lichtman (2003), Hamdani (2002), Just (2003), Yen (2000).
Nevertheless, should this ‘best-avoider’ position legally bind them to bear the costs of surveillance on behalf of copyright holders? Indeed, in a Coasean perspective, the latter are the ultimate beneficiaries of such activity and the former value the most the fact of preventing unauthorized sharing. So, by considering that copyright holders and intermediaries can negotiate with one another at low cost, zero liability could lead the former to negotiate on a purely market basis with the latter in order to put an end to such activities. Negotiations are likely to occur if intermediaries derive no or non-significant gains from infringing conduct of individual copiers. Practically, copyright holders would offer remuneration to ISPs for implementing filtering systems. However, such privately-negotiated remuneration may be insufficient to compensate gatekeepers. Indeed, the private costs associated with the elimination of unauthorized sharing encompass the costs of implementing surveillance systems. Moreover, such systems represent a lot of risks for their adopters. Firstly, filtering and anti-copying devices could have negative consequences due to the elimination of legal contents. Producers and users of such legal contents are likely to bring actions against them. Secondly, each intermediary could find an element of differentiation by not implementing surveillance devices over their networks or on their recording apparatus. This strategy obviously is all the more probable since their products or services are dedicated to the copying and sharing of contents or mainly used as such by their customers. Consequently, such Coasean negotiation must fail and no efficient solution is feasible without explicit government intervention or legislative reform in order to determine what kind of liability gatekeepers should face.

Accordingly, there are various alternative arrangements: strict liability and hybrid forms of indirect liability. Note that most of the suggested arrangements in the field of liability suppose that intermediaries actually bear the full cost of implementing detecting and policing systems. From our standpoint, their best technical position is one thing. Another one is to place the entire burden of surveillance only on them. In other words, unless they would be suspected to directly fully benefit from copyright violation, why should gatekeepers bear all or part of the surveillance cost?

Copyright stakeholders consider strict liability as the best arrangement to eliminate ‘digital pollution’. However, this assertion holds only if online intermediaries actually are copyright infringers. Nevertheless, according to Lichtman & Landes (2003), the main drawback of legal liability is to eliminate legitimate uses of implicated tools and services (recording material, P2P, broadband access to send heavy attached document and so on). Lemley and Reese (2004) argue that actions against direct users rather than against gatekeepers are preferable: 'Copyright owners sue facilitators online because it is cheaper and easier than suing direct infringers. Cheaper and easier does not necessarily mean more efficient, however. The shift toward suing facilitators who are further and further removed from the act of direct infringement imposes substantial social costs on both legitimate users and on innovation, costs the copyright owners do not have to bear.’

According to many lawyers, ISPs should only be liable where (1) they know of infringing material, (2) they are able to control it, and (3) they do not take action to prevent infringement. Such secondary liability ultimately—once copyright holders have detected infringing conducts or material—can be an effective enforcement tool. However, criticisms can be addressed against third-party liability. The results of Gayer and Shy (2003) can be extended to the liability of online intermediaries. Indeed, this legal solution could be considered as acting similarly as the hardware taxation by leading online intermediaries to overprice their services to the detriment of final consumers and society as a whole. It could result in an inefficiently restricted access to the Internet. By conferring copyright holders effective control right on new technologies that could facilitate infringement, such arrangement runs the risk of restricting innovation too. Finally, whereas it should help to prevent infringement, third-party liability actually lead to a excessive control over the sharing technologies. By being an unjustified burden on the sole online intermediaries, it could lead ISPs—other than Internet access providers—to move outside the country. Consequently, access providers de facto prove to be the only ones to bear the different costs associated with the legal actions initiated by copyright holders. This unbalanced solution could weaken their market position and collective reputation. And from the standpoint of users, as the DRM and intrusion devices, third-liability can constitute a threat to freedom of speech and privacy.

Lastly, prohibitive licenses appear to be a solution is derived from third-party liability. It consists in imposing a prohibitive tax on uploading streams. Lemley and Reese (2004) suggest this solution because it targets direct infringers rather than intermediaries. This solution can be technically effective in eliminating unauthorized sharing. However, it can also eliminate socially useful activities.

From our point of view, all these arrangements designed to eliminate digital pollution prove to be socially inefficient by leading to an overprotection of contents. Moreover, they all depend heavily on technological riposte from hackers and the like. DRM can be defeated, sabotage can be detected, anonymity can be preserved thanks to camouflage technologies, and so on. And innovation has no limit in the technological competition opposing copyright holders against infringing users (Dam, 1999). These activities as well as spamming, virus dissemination,
false information, and so on, are often supposed to pollute the Internet to such an extent that online legal activities could disappear. Such a pessimistic standpoint is largely contestable. Email keeps on developing, viruses has not eliminated BtoB business... Therefore, this suggests that the social costs they represent is significantly lesser than the benefits of 'keeping alive' the Internet. More fundamentally, these enforcement tools could be thought of an attempt to transform the very nature of Internet into a business platform by eliminating direct exchanges between individuals\(^\text{12}\).

### 3.2. Case 2: No 'pollution', but a social preference for compensation

Another situation is that there is no digital pollution, that is noncommercial sharing does not reduce sales in physical stores or e-distribution. But governments or society choose to favor or to impose arrangement(s) designed to compensate creators for any use of their works. The adopted solution in this case do not aim at protecting and encouraging production of new creations. Instead, their social objective is to compensate authors, artists, even publishers for the noncommercial sharing uses made from their works. According to Hurt and Schuchman (1966), copyright is less a economic right than (1) the natural right of any individual to own the fruit of his creative activity (Lockean theory of labor); (2) the moral right to have one's creation protected as an extension of one's personality (Kantian conception); or (3) the right to a social reward for one's contribution to the culture of the nation. Of course, all the suggested arrangements could have some encouragement effects, but this is not their main purpose.

The hypotheses underlying this second scenario then are the following:

1. **Unauthorized sharing** – online or offline – is supposed to represent no social costs but those engaged in enforcement actions against them. In other words, it doesn't affect new and traditional form of commercial distribution, whereas copyright enforcement against it would represent a net social loss in terms of implementation and social costs.

2. **To keep up the copyright/droit d'auteur system by rewarding creative activities is considered as a social preference.**

Different existing arrangements permit to compensate the producers of intellectual creation for noncommercial use\(^\text{13}\). They can be extended to compensate creators for the value of the noncommercial sharing of their works. Efficiency comparative analysis aims at determining which one permits to collect the highest compensation while minimizing the social cost of revenue distribution.

#### Online 'gift/counter-gift'

A first solution is to favor the implementation of electronic system through which individuals can give money to the creators of the works they share. The underlying idea is that the availability of works over sharing networks can be considered as a kind of 'gift' from their authors, interpreters and publishers. In counterpart, users can pay them on a voluntary basis thanks to digital system (dedicated websites, for example). This 'countergifts' therefore cannot be assimilated as charity or kindness. The advantages of such an arrangement is that (1) individuals determine themselves the payment according to their willingness to pay and (2) they pay according to the works they share and their producers.

Obviously, this arrangement is subject to several criticisms. The main one is that too modest remuneration is likely to be paid to artists (see Netanel, 2003). Note that the question is not to allow content producers to recoup their fixed costs, but how to compensate creators\(^\text{14}\) for noncommercial sharing that is supposed not to be a digital pollution. So too modest remuneration here means that collected sums don't reflect the social value of works which are shared over noncommercial networks. In other words, free riding argument suggests that few people will choose to pay for something they can get for free. However, experiences on payments for pure public goods show that free riding has lesser effects than those predicted by theory (Andreoni, 1995, Pommerhene and Schneider, 1981). Moreover, gift/counter-gift arrangement is likely to be less costly than alternatives such as statutory licenses or subsidies (see below). It represents no administrative costs and no conflict of distribution. Contrary to the legal license, there is no fixed price since users choose the level of their 'counter-gift' according to their willingness to pay\(^\text{15}\).

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\(^{12}\) Another perspective is to consider that the Internet as an intermediation/infomediaion technology is going to be no longer used as the current PC model. ADSL pay-TV and video on mobile phones are perhaps the best examples of commercial channels to understand how digital distribution could evolve in the near future (Rochelandet, 2004).

\(^{13}\) For example, in many countries, private copying within a family circle is authorized with a blank tape levy whose receipts are distributed to copyright owners (Farchy and Rochelandet, 2002). Another example is the gift system in the field of freeware according to which users can click a specific button placed on the software in order to make a gift to its author(s). Finally, inventors and authors often benefit from state subsidies as a reward for their intellectual contribution.

\(^{14}\) This category could encompass publishers and record and movie producers for their creative contributions to the works.

\(^{15}\) In the same way, Merges (1996) shows that statutory compulsory license are subject to 'legislative lock-in'. Here, compensation level is not constrained by interest group pressure during collective negotiations. Curiously, Netanel (2003) doesn't quote this argument against licenses.
A second drawback of ‘counter-gifts’ is that this arrangement is likely to concentrate on the most famous artists. Promotion and past works or performing may impact positively the willingness to pay of their fans. This could significantly favor the asymmetric distribution of revenues. But once again, this arrangement is nothing else than an attempt to compensate content producers according to the social value of their production and this social value obviously is influenced by marketing efforts and cross-externalities between works.

- **Noncommercial use levies** (compulsory or statutory licenses)

Some commentators put forward an arrangement based on a ‘noncommercial use levy’ (Netanel, 2003, Curien, 2004). Such kind of levies could be aimed at recapturing royalty income ‘lost’ to copyright holders when sharing activities represent a direct switch from purchases of original contents or to maintain the legal demand for contents by enabling thus the copyright industries to sustain their business. In the ‘no pollution’ scenario, this is not its main purpose because there is no loss due to unauthorized sharing. Online middlemen and other gatekeepers should be subject to specific tax only to compensate creators for the sharing of works. Even though it could act as an incentive to further creations, it is not designed for compensating possible losses since it is supposed that creators and their economic partners can derive sufficient remuneration from commercial distribution.

Such noncommercial use levies have many advantages. They appear to be a compromise by solving the recurrent encouragement/access dilemma in the field of intellectual property: they allow content producers to obtain remuneration for the uses made of their works while offering individuals unrestricted access to them. At the same time, by contrast to the current system of exclusive rights, transaction costs may be significantly lower with such an arrangement since negotiation and contract costs are suppressed. Furthermore, according to Netanel (2003), digital technologies can minimize administrative costs associated with distribution of collected sums.

Various solutions are to be distinguished according to the fiscal base of the levies: download and/or upload flows, final users’ subscriptions to online services, price of recording and transmitting material (CD-R, modems, hard-disk and so on), the net revenue of ISPs and copying hardware manufacturers.

However, three main criticisms can be addressed to such an arrangement. Firstly, levies cannot yield sufficient funds to compensate copyright holders without imposing unacceptable costs on consumers (see footnote 15). According to Netanel (2003) and Curien (2004), this is not really a problem because the extent of P2P sharing activities permits to raise revenues more than sufficient to compensate copyright owners and even to finance all production of cultural goods. However, if we refer to Merges (1996), this kind of arrangement is subject to institutional lock-in and collective valuation of the level of such noncommercial levies. Collective valuation substitutes for the individual valuations reserved to the copyright holders. The fact that they are established at a collective level (by the legislature or by independent agencies) makes them susceptible to lobbying and dependent from the pervasive influence of private interest groups16. As such, the level of remuneration would quickly become insufficient to compensate authors.

Secondly, noncommercial use levies would create the conditions for unfair competition and some kind of economic dependency. Implementing statutory levies to compensate creators could have unwanted effects such as leading more and more individuals to share contents through more and more sophisticated and easy-to-use systems. Consumers may in fact interpret noncommercial levies as an access price to have the full entitlement to copy and share works rather than as a legitimate fair compensation to creators. As such, this arrangement engenders a form of distribution impeding the emergence of any commercial digital distribution17. Unfair competition created by noncommercial user levies could endanger all the more commercial distribution since levy rate must not change on the long term and remain close to its initial level. In the long run, as levies expand by increasingly covering the financing of cultural creation, they could engender a form of economic dependency of contents producers vis-à-vis the collected funds.

Thirdly, cross-subsidization between no users/low-volume users and high-volume users appears to be inequitable. It is also one of the drawbacks of state subsidies.

- **State subsidies**

State subsidies are often thought as an alternative to the exclusive copyrights that would become increasingly ineffective in the digital economy (Romer, 2002). The main advantage of this solution is that it permits to fulfill the two main (and often contradictory) goals of any cultural policy: to favor the creation of works and to promote their largest dissemination.

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16 Merges (1996) takes as example the history of the mechanical compulsory license in copyright law.
17 However, as already mentioned, content producers have to innovate to beneficially exploit these new sharing activities.
In the scenario considered here, the problem is quite different because subsidies are not to encourage or to enable the production of new works. State subsidies, rather, aim at compensating creators for noncommercial sharing of their already produced works. The more shared a work, the higher is the share of subsidies received by its creator(s). Of course, it could thereby encourage creators to produce new works, in order to benefit from this remuneration. It is not really a drawback since only shared contents give rise to subsidies.

Compensation is a socially preferred option because of the large-scale benefits associated with culture and knowledge. So it seems fair that all members of society pay—through state budget—to compensate creators for the noncommercial uses of their works. Moreover, as with noncommercial levies, state subsidies permit to preserve innovation and free access to works through sharing activities. But contrary to noncommercial levies, subsidies do not tax specifically sharing activities and thereby they preserve innovation, in particular in the case of P2P networks by avoiding to taxing the business of sharing software and online services producers.

On the other hand, it is subject to the same criticisms concerning the effective mechanisms for the distribution of the remuneration and the cross-subsidization between small (no) users and large-scale users of shared works. This last distortion is all the more intense since payments based on general tax revenues concern a wider population than in the case of noncommercial levies. In other words, the proportion of law-abiding citizens—who do not share any content—pay for unauthorized sharing is largely greater than in the case of taxation of ISPs and noncommercial levies.

More generally, state subsidies have been criticized because of the risk of censorship and favoritism of certain groups of artists. However, state subsidies could be established by guarantying some objective standards for the distribution of remunerations to creators, i.e. according to data on effective sharing. Here, contrary to noncommercial levies—that are likely to be administrated by collective right organizations such as current private copying fees—, government agency can ensure better neutrality for such distribution. In addition, according to Johnson (1985), it is necessary to take into account the opportunity cost of such a use of public funds. From a social point of view, a tax cut or the financing of another activity could be more beneficial than a reduction in the prices of originals (which does not benefit directly all consumers). Finally, if subsidies are extended to producers, they are likely to provide a disincentive for them to innovate and find another methods of appropriation such as self-help technological systems.

To some extent, the gift/counter-gift and state subsidies appear to be complementary. Thereby, counter-gift could be encouraged—or free riding could be discouraged—by implementing tax deductions in favor of those who make consequent counter-gifts. Such an arrangement could be more efficient than noncommercial levies in compensating creators for their intellectual contribution.

### 3.3. Case 3: ‘Copyright abandon’ or ‘To innovate or to perish’

French cinema at the very beginning of the 20th century was endangered by free riding behavior of funfair merchants who exploit movies. Indeed, producers sold them films according to their physical length in meters and then funfair merchants share copies among them. This behavior implied fewer sales and reduced turnover for film producers. One solution was to enforce copyright but movies was in fact not yet protected by any kind of intellectual property. The other solution, which was invented by Charles Pathé in 1907, was to impose a renting system, which put an end to the funfair exploitation of movies and since then, which has allowed a better control of the distribution of movies (Rochelandet, 2000). As a general hypothesis, when the agents have at their disposal the means of identifying and excluding technically users or of appropriating indirectly the value of such uses, they would not need any intellectual property rights legally enforceable.

In fact, by resorting to the usual analysis of the demand for originals and copies (see Besen & Kirby, 1989, Koboldt, 1995), we can understand the current strategies of the major copyright owners. Consider a copyrighted musical work. Suppose that each individual is willing to obtain at most one exemplar whatever its origin: legitimate copy or unauthorized copy. Let $V_i(x)$ denote the value placed by consumer $x$ on a legitimate copy and $V_u(x)$ the value placed by her on some unauthorized copy. The market price of a legal copy is denoted by $P_L$. The "price" of getting an illegal copy through a P2P network is denoted by $P_R(x)$. It represents the legal costs of being caught and the psychological cost of breaking the copyright law. And suppose that there is in both cases some transaction costs incurred by individual $x$ with searching and getting the most legal or unauthorized copy denoted respectively $C_L(x)$ et $C_u(x)$. The individual $x$ will buy a legal copy if and only if:

$$V_i(x) - P_L - C_L(x) > V_u(x) - P_R - C_u(x)$$

In other words, the net gain from consuming a legal copy perceived by individual $x$ must overcome the net gain from consuming an unauthorised copy.

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18 This goal doesn't contradict Breyer (1970), according to which state subsidies have to be limited and complementary to other copyright alternatives.
In order to fight against unauthorized sharing, recording producers have considered only the term \( V(x) - P_0 - C(x) \) by trying to reduce it. Trials and anti-circumvention dispositions are supposed to increase \( P_0 \); 'Sabotage' and inoculation of false files aim at increasing \( C(x) \) and reducing \( V(x) \); and so on. But what about \( V(x) - P_0 - C(x) \)? Why don't recording producers and now film producers concentrate in innovation and marketing strategies to promote traditional and online music business?

Our third scenario considers noncommercial sharing as a consequence of the transition to a digital economy rather than as an impediment. So there is no (irreversible) pollution. Assuming a digital pollution appears to be a static standpoint. As a consequence, it would be largely inefficient to try to come back to the precedent situation, i.e. intermediation and direct sales. The very methods that proved efficient in the previous sociotechnique paradigm do not apply anymore against the digital copying and sharing technologies. In the same way as the 'hertzian' revolution during the interwar period, the nature of intermediation has deeply changed and content producers and distributors have to devised new models. Any legal interference such as copyright reinforcement may have serious and irreversible consequences by preventing innovation to occur. Moreover, holding millions of individuals as burglars or thieves is very problematic and trying to legally prevent them from swapping contents (in a gift/counter-gift basis) represents a blind perspective that underestimates the potentials associated with the current social evolution.

Consequently, there is no digital pollution and there is no need to compensate anyone since it could interfere with current transformations. This third scenario is then based on the following hypothesis:

(3.1) ICTs are assumed to be sufficient to generate viable private arrangements in the digital economy. So pollution doesn't exist in a dynamic perspective.

(3.2) Any kind of government interference with market and/or creative process is not socially desired. So compensation measures, even though it would be a collectively preferred solution now, could act as a false signal for market and thereby it could have harmful consequences in the future.

Laissez-faire must be the rule. If need be, protection should be orientated towards individuals –consumers, authors, artists– rather than organizations whose market power is supposed to be superior on average. In other words, no law must be designed in favor of vested interests: no anti-circumvention rules as well as no specific copyright exemptions, just general rules about property rights, contracts and competition law.

At worst, even though major content producers would suffer from unauthorized sharing –making their profit slowdown–, either they innovate by devising some efficient business model such as a commercial exploitation of P2P networks and strategic alliance with the publishers of sharing software, or they perish. In this case, their activities may be taken over by those who benefited the most of them, i.e. commercial intermediaries. Once again, history gives us some lessons. The biggest record producer –Victor Record– was bought out by RCA in 1929. Indeed, its business –records manufacturing and distribution– was undermined during the 1920s by the expansion of radio activities. At that time, many legal actions had been brought against radio station. But ex post, would it be socially desirable to have endangered the development of the first broadcasting media? After the Second World War, phonograph industry came back to life thanks to long-playing record and since then, an economic compromise has been reached between record producers and radio station that promotes musical titles and albums.

In a market economy, one could wonder whether State should interfere with market and whether nonmarket failure inherent to such intervention is not greater than market failure due to non-rivalry of information and cultural goods. Copyright could be considered as nothing else than entry barrier in the sole benefits of majors companies.

4. Concluding remarks

Copyright can be conceived as an encouragement for the production of new works. Alternatively, it could be considered as a natural right of any individual to own the fruit of his creative activity (Lockean theory of labor), a moral right to have one's creation protected as an extension of one's personality (Kantian conception) or the right to a social reward for one's contribution to the culture of the nation (Hurt and Schuchman, 1966). If we adhere to the utilitarian conception and if noncommercial sharing appears to be a source of 'digital pollution', it must be restricted to such an extent that incentives to produce new works are preserved. However, all existing arrangements to achieve this objective are likely to produce a net social loss. The diversity of the institutional arrangements studied in this paper recommend against immediate adoption of a rigid legislative liability rule. In the absence of pollution, the question is quite different: Should compensation or social (ex post) reward be given to individuals for their creative activities? If so, different compensation arrangements exist and among them, counter-gift combined with state subsidies may be the most efficient one. If not, copyright abandon appears to be a more valuable option from a welfare point of view. Alternatively, any institutional option could generate irreversibility and hamper the emergence of viable business models.
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